CLAIMS

What is Claimed is:

11. A force detecting capacitive sensor comprising at least two electrodes integral with a transparency product, said electrodes having mutual capacitance affected by force acting against the transparency product.

12. The sensor of claim 11 wherein at least two of said at least two electrodes are parallel with one another.

13. The sensor of claim 11 wherein at least two of said at least two electrodes are non-parallel with one another.

14. The sensor of claim 11 wherein at least one of said at least two electrodes comprises a conductive coating integral with the transparency product.

15. The sensor of claim 11 wherein said electrodes are configured for discriminating different vehicle crash characteristics.

16. The sensor of claim 15 further comprising a vehicle occupant protection system comprised of at least one occupant restraint device which operates in conjunction with said sensor.

17. The sensor of claim 11 wherein said sensor distinguishes between a visibility condition and an object in proximity to the transparency product based on said sensor response.

18. The sensor of claim 17 further comprising a vehicle occupant protection system that operates in conjunction with said sensor upon detecting an object in proximity to the transparency product.

19. The sensor of claim 17 further comprising means for initiating a response to modify a detected visibility condition.

20. A method of compensating for the long-term effects of temperature on a sensing system, the method comprising the steps of:

determining the constant desired sensor output;

determining low frequency shifts due to temperature effects;

comparing the constant desired sensor output to the low frequency shifts due to temperature effects; and

employing a compensation algorithm to account for the difference.

21. A vehicle occupant detecting capacitive sensor comprising:

at least one capacitive sensor; and

a conductive panel functioning as a vehicle airbag door and ground plane for said at least one capacitive sensor.

22. The sensor of claim 21 wherein said capacitive sensors are fabricated on a substrate material adjacent said conductive panel.

23. The sensor of claim 21 wherein said capacitive sensors are each assigned to at least one triangle for discriminating occupant proximity and providing data to an airbag controller.

24. The sensor of claim 21 wherein said capacitive sensors comprise circular capacitive sensors.

25. A method of configuring a capacitive sensor and a reference sensor on a dielectric substrate, the method comprising the steps of:

fabricating a reference sensor and a capacitive sensor on a substrate;

placing a monolithic ground on a reverse side of the substrate;

attaching a printed circuit board to a deleted portion of the monolithic ground;

connecting the reference sensor to electronic parts on the printed circuit board; and

compensating for changes in capacitive sensor output which are not related to proximity of a vehicle occupant by comparing the capacitive sensor output to the reference sensor output.

26. A method of detecting head motion indications of a drowsy vehicle operator, the method comprising the steps of:

representing the drowsy vehicle operator's head motion with a four-dimensional feature vector;

training a feature detection network; and

utilizing a sleep detector to detect head motion associated with an alert operator and head motion associated with a sleep nod.

27. The method of claim 26 further comprising the steps of:

customizing the sleep detector for individual vehicle operators; and

identifying the operator of a vehicle and modifying sleep detector parameters base on historical data attributable to the identified operator.

28. A capacitive occupant sensing system for a sunroof equipped vehicle to monitor an occupant's head position, said system comprising:

a nested circle capacitive sensor; and

at least one L-shaped capacitive sensor adjacent said nested circle capacitive sensor.

29. The system of claim 28 wherein said nested circle capacitive sensor and said at least one L-shaped capacitive sensor are located adjacent the sunroof.

30. The system of claim 29 further comprising a dummy sensor located on the opposite side of the sunroof from said nested circle capacitive sensor and said at least one L-shaped capacitive sensor.

31. A method of sensing an occupant's head position in a sunroof-equipped vehicle with a dummy sensor and a nested circle capacitive sensor array, the method comprising the steps of:

positioning a dummy sensor on an opposite side of the sunroof from a nested circle capacitive sensor array adjacent the sunroof; and

deriving a composite head position from the dummy sensor head position and the triangulated head position from the nested circle capacitive sensor array.